# Students First

# A Guide for Students

Preparing to Write
the Mathematics 30
Diploma Examination

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# Preparing to Write the Mathematics 30 Diploma Exam

*Dear Student:*

*The authors of this guide are staff from the Student Evaluation Branch. These are the people who actually put together the exam you will be writing. They also organize the marking sessions and train the teachers who mark the exams. These people see first-hand what thousands of students are doing right (and wrong) when they write an exam.*

*This guide and all other diploma exam-related materials produced by Student Evaluation Branch staff are identified with the logos*

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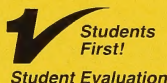
*I hope you will find this guide helpful. Good luck on exam day!*

*Frank Horvath, Director*
*Student Evaluation Branch*

# Getting ready

**✓ Start now**

The most effective way to prepare to write the Mathematics 30 Diploma Exam is to start right at the beginning of the course developing your problem solving and communication skills. For each topic that you study, try to find applications in your daily life and in the technology that surrounds you.

Practice expressing mathematical ideas by speaking, writing, demonstrating, and depicting them visually. Use mathematical vocabulary, notation, and structure to represent ideas, describe relationships, and model situations.

Remember that your problem-solving abilities are assessed on the evidence you provide that demonstrates your ability to formulate problems, apply a variety of strategies to solve problems, verify and interpret results, and generalize solutions.

**✓ Understand the exam's design**

The Mathematics 30 Diploma examination consists of 40 machine-scored multiple-choice questions and nine machine-scored numerical-response questions, equally weighted, and three written-response questions, equally weighted. The multiple-choice and numerical-response questions are worth 70% of the examination. The three written-response questions are each scored on the five-mark scoring rubric shown on page 5.

Together, the three written-response questions make up 30% of the exam. Refer to page 10 for an example of a calculation of a student's diploma examination mark.

The content for the Mathematics 30 Diploma Examinations in the machine-scored section (multiple-choice and numerical-response) is emphasized as follows:

| Content[1] | Percent Emphasis |
|---|---|
| Polynomial Functions | 11 |
| Trigonometric and Circular Functions | 12 |
| Statistics | 5 |
| Quadratic Relations | 10 |
| Exponential and Logarithmic Functions | 11 |
| Permutations and Combinations | 10 |
| Sequences and Series | 11 |
| *Total Multiple-Choice and Numerical-Response* | *70* |

## ✓ Multiple-choice

For the multiple-choice questions, you are to choose the correct or best possible answer from four alternatives. Do not look for a pattern of the A, B, C, or Ds, because there is none. Remember that the examination booklet is yours. Write anywhere in the booklet you wish. When you review your work, this could save you time. It is also a good idea to circle your response in the booklet, so that if your bubbled selections on the computer scan sheet "get out of synch." you have a means of checking your selected responses.

## ✓ Numerical-response

For the numerical-response questions, you are asked to calculate a numerical answer and record your answer on the computer scan sheet, usually correct to the nearest tenth or nearest hundredth. Sometimes the answer you are to record is not a decimal value; for example, "the number of people is _____ ."

Remember to record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles. Enter the first digit of your answer in the **left-hand** box and leave any unused boxes blank.

If you wish to change an answer, erase **all** traces of your first answer.

In the **Mathematics 30** examination, there is no provision to record negative signs for numerical-response questions, so if your solution contains a negative sign, you must have made an error.

## ✓ NEW

> The numerical-response questions are dispersed throughout the multiple-choice questions, placed according to content topic.

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[1] Content descriptions have been shortened in this table.

## Samples of numerical-response questions and solutions

1. Correct to the nearest tenth of a radian, $40°$ is equal to _____ rad.

$40° = 0.6981317008 \ldots$ rad

```
┌─┬─┬─┬─┐
│0│.│7│ │
└─┴─┴─┴─┘
    ● ⊙
 ● ⓪ ⓪ ⓪
 ① ① ① ①
 ② ② ② ②
 ③ ③ ③ ③
 ④ ④ ④ ④
 ⑤ ⑤ ⑤ ⑤
 ⑥ ⑥ ⑥ ⑥
 ⑦ ⑦ ● ⑦
 ⑧ ⑧ ⑧ ⑧
 ⑨ ⑨ ⑨ ⑨
```

2. For the arithmetic series $-8 + (-5) + (-2) + \ldots + (85)$, the number of terms is _____.

$85 = -8 + (n - 1)(3)$
$93 = 3n - 3$
$n = 32$

```
┌─┬─┬─┬─┐
│3│2│ │ │
└─┴─┴─┴─┘
    ⊙ ⊙
 ⓪ ⓪ ⓪ ⓪
 ① ① ① ①
 ② ● ② ②
 ● ③ ③ ③
 ④ ④ ④ ④
 ⑤ ⑤ ⑤ ⑤
 ⑥ ⑥ ⑥ ⑥
 ⑦ ⑦ ⑦ ⑦
 ⑧ ⑧ ⑧ ⑧
 ⑨ ⑨ ⑨ ⑨
```

✓ **Written response**

The three written-response questions assess your ability to draw on your mathematical experiences to solve problems and to explain mathematical concepts. These questions do not necessarily fall into a particular unit of study but may cross more than one unit, or may require you to make the connections between mathematical concepts.

This section of the examination focuses on your understanding of the process of solving a problem and encourages you to take risks to arrive at a solution. It also focuses on your understanding of mathematical concepts and allows for the most flexibility in determining your communication and problem-solving skills in mathematics.

Remember, even an attempt at a solution could be worth some marks. If you leave your paper blank, markers will not be able to award any marks. Read the entire question. Although you may not be able to answer the first part of a question, you may be able to answer subsequent parts. Be familiar with the meaning of directing words that you may encounter on the exam (see Appendix B).

In scoring the written-response section of the examination, markers will evaluate you for how well you
• understand the problem or the mathematical concept
• correctly use the mathematics
• use problem-solving strategies and explain your answers and procedures
• communicate your solutions and mathematical ideas

The open-ended written-response part of the examination is designed to allow you to communicate a response by asking you to explain your reasoning, explain your solution, describe

mathematical situations, write directions, create new problems, create new strategies, generalize a mathematical situation, and/or formulate hypotheses.

The general five-point scoring guide given below is the current basis markers use to evaluate your solutions. Ask your teacher to show you *Specific Question Scoring Rubrics* used on the January and June 1996 diploma exams. These are found in a publication titled *Mathematics 30, Diploma Examination Results, Examiners' Report for January 1996* or *June 1996*. These are sent to each high school in Alberta.

✓ **Written-response general scoring guide**

Credit may be given to students who show unusual insight. If their solutions fall outside *Specific Question Scoring Rubrics*, they will be scored against the *General Scoring Guide* shown below.

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### GENERAL SCORING GUIDE

**5 marks**  The student
- demonstrated a *complete understanding* of the problem
- used mathematical knowledge and problem-solving techniques to find the solution
- justified the solution and explained its relevance to the problem

**4 marks**  The student
- demonstrated *an understanding* of the problem
- chose a strategy that used mathematical knowledge and problem-solving techniques to find a solution, but the procedure contained *a minor flaw*
- showed *some justification* of his or her results

**3 marks**  The student
- demonstrated *some understanding* of the problem
- formulated *some aspects* of the problem mathematically
- demonstrated the use of a strategy that used mathematical knowledge and problem-solving techniques to find a *partial* solution
- communicated little understanding of the complexities of the problem

**2 marks**  The student
- explored the *initial stages* of the problem
- applied *some* relevant mathematical knowledge and problem-solving techniques to find a *partial* solution

**1 mark**  The student
- applied some relevant mathematical knowledge to the problem

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✓ **Understand the calculator policy**

The Calculator Policy can also be found in the *Mathematics 30 Information Bulletin, Diploma Examinations Program*. Read it carefully. Students are expected to use a scientific calculator when writing diploma examinations in mathematics and science. Calculator memories must be cleared of all stored information except for the formulas that appear on the data tear-out pages or in the data booklets and the programs used for graphing quadratic relations in Math 30/33. It is **your responsibility** to ensure there is no information stored in the calculator you are using except what is specifically allowed by this policy. Failure to do this is a breach of exam procedures and is considered cheating. It is not worth taking a chance. If you are unfamiliar with how to clear calculator memories, talk to your teacher.

| | |
|---|---|
| ✓ **Use your formula sheets and _z_-score table** | There is a tear-out formula sheet and a _z_-score page provided in all Mathematics 30 diploma examinations. |

## *What you can do to prepare*

| | |
|---|---|
| ✓ **Prepare a review schedule** | • Design your schedule for the two-week period (minimum) before the examination<br>• Divide the course material into sections and indicate on the schedule the time blocks to be devoted to each section<br>  – take into account the examination blueprint available from your teacher (*Mathematics 30 Information Bulletin, Diploma Examinations Program*). Note that course units are not equally weighted on the diploma examination.<br>  – take into account units/concepts that you find most difficult; i.e., allocate more time for the review of these |
| ✓ **Don't cram** | Short-term memory does not have enough space for all you need to know. Also, cramming stupefies long-term memory (where well-learned material lives) and it can set you up for panic and "blanking." |
| ✓ **Start well in advance, break your studying into chunks, and review often** | • A week or more before the exam, do an initial overview (a two- to four-hour quick review of the material). This will help to motivate you and to determine the structure of the course, what your most difficult material is, and the volume to be covered.<br>• Develop and follow a plan for getting yourself through this volume of material, starting (if possible) with your most difficult material.<br>• At the beginning of each study period, do a ten-minute review of the previous period's material. |
| ✓ **Study from the "top down"** | It is easier to understand and retain material that is well organized. Therefore, start with a good grasp of the course's main ideas and follow with the sub-topics and supporting details. |
| ✓ **Study by jogging your memory** | Real understanding comes, not when we stuff information in, but when we draw it out. Exams require this drawing out of information. So this should be the focus of studying: answering questions, solving problems, writing essays, defining, explaining, applying terms, and working through past exams. |

| ✓ **Don't take in any new material the night before an exam** | You want to build confidence by reinforcing what you know rather than running the risk of scaring yourself by discovering something you don't know. Also, you want to avoid a temptation to cram. |
|---|---|

✓ **Find examples of each type of questions**
- Obtain a copy of the relevant information contained in the *Mathematics 30 Information Bulletin, Diploma Examinations Program* (available from your teacher)
- Review the format of previous diploma examinations (available from your teacher)
- Learn the meanings of key "directing" words (Appendix A)
- Review the different question formats and the instructions on how to answer these questions

✓ **Make summaries and outlines**
- Distinguish between major concepts and factual details
- Identify essential skills that can be assessed on paper and pencil tests
- Review project results and procedures—identify connections between project reports, class notes, and textbook
- Anticipate examples of connections between concepts and the "real world"
- Prepare a glossary of important subject terminology
- Link each formula or equation with a calculation done on a previous test or assignment
- Identify any restriction on the use of each formula or equation

✓ **Develop memory aids**
- Colour code, underline, highlight, jot key words in margins
- Number points to be memorized
- Group word and idea associations
- Read key words aloud, express key words in your own words

✓ **Review schedules, rules, and policies**
- Record the time and place of writing
- Note minimum and maximum writing times permitted
- Prepare to remain in the examination room for at least 2.5 h (Kleenex, cough drops, etc.)
- Identify materials allowed for writing each examination, such as pencils, pens, calculators, mathematical instruments, and clear plastic ruler

## *How to do your best when writing the exam*

✓ **Be comfortable**
- Make yourself comfortable. Wear comfortable clothes, eat well and get plenty of rest.

**✓ Be prepared**

- Arrive a few minutes early and check that you have all necessary supplies. A spare calculator is not a bad idea. Make sure you've cleared your calculator memories of all information, except what is specifically allowed in the Calculator Policy. It is published each fall in the *Mathematics 30 Information Bulletin, Diploma Examinations Program.*

**✓ Pace yourself**

- Keep track of the time and pace yourself. Put a mark by items that you are uncertain about and return to them if there is time at the end of the examination.

**✓ Answer every question**

- Do not be afraid to answer each question even if you are not sure of the correct solution to the problem. A penalty is NOT given for guessing on the machine-scored section the exam. Partial marks are often awarded for incomplete answers in the written-response section of the examination.

**✓ Use logical guessing**

- If you are stuck on a question, mark the alternatives that you know are incorrect and choose from the ones that are left, using logical guessing strategy. Think of the questions as challenges and cultivate a positive attitude about your ability to answer them.

**✓ Look over the entire exam**

- Scan the sets of questions on the examination before answering a particular question. The questions in one set of the examination may jog your memory about a question in another set.

**✓ Identify key words**

- When first reading a multiple-choice question, locate and circle key words to help clarify the meaning of the question. Then, hide the alternatives and try to formulate an answer of your own. Your answer may be very close to the correct alternative.

**✓ Do calculations first**

- If a multiple-choice question involves a calculation, do the calculation and select the alternative that is closest to your answer. A multiple-choice calculation is usually short. If you cannot do it in five minutes, your method is either inappropriate or incorrect. Go on.

**✓ Label diagrams**

- Diagrams on examinations are often labelled with numbers or letters. It may be useful to jot down the names of the labelled features that you can identify.

✓ **Use a clear ruler**

- When reading graphs, use a clear plastic ruler to more accurately extrapolate or interpolate data.

✓ **Don't look for patterns**

- Have a good reason for changing an answer. Do not change an answer on a hunch.

✓ **Prepare an outline**

- You may not have time to write and edit a complete rough copy for each written-response question, but you should prepare an outline of your answer and use it as a guide when writing your good copy.

✓ **Think about what you are telling the marker**

- When completing a written-response question, keep in mind the reader of your response. The reader will want to know how well you
  - understand the problem or the mathematical concept
  - can correctly use the mathematics involved
  - can use problem-solving strategies and explain your answer and procedures
  - can communicate your solutions and mathematical ideas

✓ **Rewrite the question**

- Rewriting a statement of the question is often a good way to begin a written response. Conclude with a summary statement. Be sure you have clearly explained all assumptions and have verified your conclusions.

## *Additional Reminders*

✓ **Further Information**

For more detailed information about the Mathematics 30 diploma examination, ask your teacher about a booklet from Alberta Education called *Mathematics 30 Information Bulletin, Diploma Examinations Program*. Each Mathematics 30 teacher will have a copy.

This bulletin contains a great deal of information about the examination as well as samples of previous written-response answers and details regarding acceptable and excellent standards. These standards include examples of questions you must be able to do to demonstrate acceptable and excellent achievement.

✓ **Rescores**

You may request a rescoring of your examination if you believe that the mark you have received is not appropriate. Before applying for a rescoring, be sure to check your *Diploma Examination Results Statement* to see what marks you have been

awarded on each section of the exam. Your mark on the machine-scored portion is not likely to change, but your written-response mark could change slightly. Keep in mind that if you do request a rescoring, your new mark, whether it increases *or decreases*, will be your final mark. The fee for this service is $26.75, which includes the GST. This fee is refunded if your mark changes by more than 5%.

Also, remember that your examination mark is calculated by a "weighting" on the different parts. The machine-scored questions are weighted 70% and the written-response questions are weighted 30%. You can't simply add your raw scores together. Do the calculation as follows:

$$\left(\frac{x}{49} \times 70\right) + \left(\frac{y}{15} \times 30\right) = \text{your diploma exam mark},$$

where $x$ is your total mark on the multiple-choice and numerical-response section and $y$ is your mark on the written-response section. This weighting of the questions has not changed in several years, but in 1996 the Mathematics 30 Diploma written-response part did decrease from four questions to three questions.

✓ **Rewrites**

You may rewrite a diploma examination at any regularly scheduled exam period. You must apply to the *Student Evaluation Branch* by November 15 and April 15 to be eligible to write the January and June diploma examinations. The fee for rewriting each exam is $26.75, which includes G.S.T. If you wish to rewrite in August, you may register and pay the fee at any designated writing centre on the day of the exam. (For more details, see the *General Information Bulletin*.)

✓ **Other questions**

If you have questions about the exam that your teacher can't answer, or if you are a student without a regular classroom teacher, feel free to call

Ms. M. Florence, Mathematics 30 Examination Manager

or

Mr. Phill Campbell, Assistant Director, Math/Science Diploma Exams at 403-427-0010.

To call toll-free from outside of Edmonton, dial 310-0000.

## *Good Luck!*

# Appendix A

**Directing words**

**Contrast/Distinguish**
Point out the *differences* between two things that have similar or comparable natures

**Compare**
Show the character or relative values of two things by pointing out their *similarities* and *differences*

**Conclude**
State a logical end based on reasoning and/or evidence

**Criticize**
Point out the *merits* and *demerits* of an item or issue

**Define**
Provide the essential qualities or meaning of a word or concept; make distinct and clear by marking out the limits.

**Describe**
Give a written account or represent the characteristics of something by a figure, model, or picture

**Design/Plan**
Construct a plan, i.e, a detailed sequence of actions, for a specific purpose

**Discuss**
The word "discuss" will not be used as a directing word on math and science diploma examinations because it is not used consistently to mean a single activity

**Enumerate**
Specify one by one or list in concise form and according to some order

**Evaluate**
Give the significance or worth of something by identifying the good and bad points or the advantages and disadvantages

**Explain**
Make clear what is not immediately obvious or entirely known; give the cause of or reason for; make known in detail

**How**
Show in what manner or way, with what meaning

**Hypothesize**
Form a tentative proposition intended as a possible explanation for an observed phenomenon; i.e., a possible cause for a specific effect. The proposition should be testable logically and/or empirically

**Identify**
Recognize and select as having the characteristics of something

**Illustrate**
Make clear by giving an example. The form of the example must be specified in the question; i.e., word description, sketch, or diagram

**Infer**
Form a generalization from sample data; arrive at a conclusion by reasoning from evidence

**Interpret**
Tell the meaning of something; present information in a new form that adds meaning to the original data

**Justify/Show How**
Show reasons for or give facts that support a position

**Outline**
Give, in an organized fashion, the essential parts of something. The form of the outline must be specified in the question; i.e., lists, flow charts, concept maps

**Predict**
Tell in advance on the basis of empirical evidence and/or logic

**Prove**
Establish the truth, validity, or genuineness of something by giving factual evidence or logical reasons

**Relate**
Show logical or causal connection between things

**Solve**
Give a solution for a problem; i.e., explanation in words and/or numbers

**Summarize**
Give a brief account of the main points

**Trace**
Give a step-by-step description of the development

**Why**
Show the cause, reason, or purpose